THE ORIENTATION OF THE ANCIENT CHURCHES OF IRELAND.[1]

PROF. J. P. O'REILLY'S paper, although mainly antiquarian, presents certain points of scientific interest worth attention for their novelty and possible application elsewhere. The two churches in question are easily accessible from Dublin, but they have not been fully and sufficiently examined. The author examines what is known of the saint to whom both the churches are said to be dedicated, giving citations from the public records relative to the saint's name and its various forms. He shows that there are at least four different saints of the name of Begga mentioned having different festival days, and points out the admitted uncertainty existing as to the dedicatory saint in question. As a solution, he takes into account the orientation of Dalkey Town Church, assuming that the church was oriented to the rising sun of the saint's festival day. The older or western part of the church is oriented E. 8° 10′ N., while the newer or eastern part or chancel has that of E. 9° 30′ N. He finds the sun to present a northing corresponding to these figures between April 11 and 15 on his passage northward, and between August 29 and *September* 2 on his passage southwards. "As regards," he says, "the festivals of saints mentioned as occurring between August 29 and September 2, the nearest in date would be that of St. Bega (September 3) (the saint venerated at Dunbar)." Hence he draws the conclusion that she was the particular St. Bega to whom the church was dedicated.

Prof. O'Reilly then considers the church on Dalkey Island, points out its remarkable position, gives the details of its structure, and argues that the belfry (so called) was most probably used as an observatory for the determination of the equinox in particular, and for the observation of the stars so as to fix the hours of service. This argument he supports by several citations and a description of the meridian line, with inscriptions, existing in St. Sulpice Church, Paris. He then compares the south-east window now existing in the Dalkey Island church with that of Dalkey Town Church, and shows their close relation in certain respects. This leads to a detailed examination of the south-east opening of Dalkey Town Church, its dimensions and probable use, for the determination of the saints' festival day by the stoppage of the sunlight rays through it at certain times of the year. He shows that this would happen for one of the compartments of the window on April 9 and *September* 4, so that here again the festival day of St. Bega of Dunbar is pointed out. As regards the orientation of Dalkey Island church, he shows that it is about E. 3° south, not due east. He explains this error from the nature of the ground as previously described, and further points out how the true east and west line is given, and was apparently fixed, by a line passing through a Greek cross carved on a rock opposite the western door, and the north-west angle of the church. Lastly, his measures having been made metrically, he finds that the unit of measurement used in the building was the Spanish "Vara" = 0·835m., and gives proofs of this. He thus raises the broad and interesting question of the unit or units of measurement having been in use in Ireland previous to the adoption of the British standard of feet and inches, and invites further investigation in this respect.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

Cambridge.—Mr. W. H. Young, Peterhouse, has been approved for the degree of Doctor of Science.

A vacancy for a university lecturer in histology has been caused by the election of Dr. Langley to the chair of physiology. The appointment will be made in the Lent term, 1904.

Dr. Dickinson, Dr. Rolleston, and Dr. Kellock have been appointed additional examiners for medical degrees on account of the large number of candidates in the present term.

The Walsingham medal for biology has not been awarded this year.

The Sheepshanks astronomical exhibition is awarded to Mr. P. E. Marrack, one of the senior wranglers of the year.

The observatory syndicate proposes that the office of assistant director of the observatory should be conferred on Mr. H. F. Newall, who has been observer since 1890, without stipend.

The graces for the organisation of the school of geography were opposed in the Senate on December 5, but were carried by large majorities. A board of studies, a special examination for the ordinary B.A. degree, and a diploma in geography are thereby established.

Sir William Mather will distribute the prizes at the Merchant Venturers' Technical College, Bristol, on Thursday, December 17.

A gift of 50,000*l.* has been made by an anonymous donor to University College, London, through Prof. Starling, to be used by the council of the college for the promotion of higher scientific education and research at that institution.

Mr. John D. Rockefeller has, we learn from *Science*, offered to give Vassar College 40,000*l.*, or such part of this sum as may be equalled by gifts from other sources before June, 1904. 10,000*l.* has so far been subscribed, and an appeal is made for further gifts.

The annual meeting of the Association of Technical Institutions will be held at the Leathersellers' Hall, London, on Friday, January 29, 1904. Sir John Wolfe Barry, K.C.B., F.R.S., will occupy the chair, and an address will be given by the president-elect, the Right Hon. Sir John E. Gorst, K.C., M.P.

It is announced from New York that the committee to control the selection for the Rhodes scholarships available for Americans has been formed. The presidents of Yale and Harvard Universities are the principal members of the committee, which also includes one representative from each State in the Union.

The University of Ottawa was totally destroyed by fire on December 2. More than five hundred students from all parts of Canada, the United States, and Mexico were in residence. Fortunately they escaped, but several professors were injured, none, however, fatally. Everything in the building was destroyed, the total loss being estimated at 500,000 dollars.

The first meeting of the court of the University of Liverpool was held on December 5, when Sir Edward Lawrence, Pro-Chancellor, presided. During the course of an address, proposing the adoption of the report and accounts, the chairman said the university had started its career with a property in land, buildings, and investments having a value of more than 500,000*l.* The subscriptions to the university movement in Liverpool amount to 170,000*l.*

A conference was held on December 4 between the consultative committee of the Board of Education and representatives of various professional bodies in order to discuss the desirability and feasibility of the introduction of a system of school leaving certificates for England. Similar conferences with representatives of universities and of the teaching profession have previously been held. Lord Londonderry attended the conference for a short time in order to say a few words on behalf of the Board of Education. Sir W. Hart Dyke subsequently took the chair.

Mr. R. B. Haldane, K.C., M.P., presented the prizes and certificates at the Borough Polytechnic, Southwark, on December 4. In the course of his address, Mr. Haldane said that with regard to the movement for the creation of a great school of technology in London, there had been a certain amount of mystery as to its relation to polytechnics and its position generally. The reason that nothing had yet been disclosed was because things were moving, but with such deliberation that it was inexpedient to present pictures of the end when they had not got much beyond the beginning. They were only in the early stages at the present time. Conferences were taking place with various experts, and it was hoped that the combined effort of the trustees of the Rosebery scheme, the Government, the great city companies, and the London University would produce a school which would be worthy of London. There would be no overlapping, but they would try to fill up the gaps, and the polytechnics would be linked to this higher school.

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[1] "Notes on the Orientations and Certain Architectural details of the Old Churches of Dalkey Town and Dalkey Island, Dublin." By Prof. Jos. P. O'Reilly. Abstract of paper read before the Royal Irish Academy, February 23.

A School Nature-Study Union has been established to utilise and make better known facilities which already exist to encourage the study of nature by pupils in primary and secondary schools, and to supplement by work in several new directions the efforts of existing associations. The prospectus of the Union states that it is proposed to promote addresses to children by supplying lantern slides and specimens to teachers desirous of giving lessons on natural objects, and by providing qualified lecturers where desired; to assist in the organisation of school rambles and journeys, in the establishment of school museums and in the arrangement of conferences and natural history field days. The inauguration of a junior department, of reading circles, of circulating libraries for teachers, is also contemplated, as well as the publication of an official organ. Sir George Kekewich, K.C.B., is the president, and the Rev. C. Hinscliff, Bobbing, Sittingbourne, is the hon. secretary of the Union.

At the annual meeting of the governors of Yorkshire College on Monday, reference was made to the charter for the new university. Donations amounting to 36,000*l.* have been promised, provided that the sum of 100,000*l.* is raised. It is essential that their annual income should be largely increased if the new university is to take the position to which its central position among the industries of Yorkshire entitles it. Lord Allerton, who presided, remarked that they had reached the stage when they might consider the charter assured. The only point raised against the title of "The Victoria University of Yorkshire" was that it might clash with that of the Victoria University of Manchester, but Lord Allerton thought the distinction was well marked. A resolution was passed authorising the council to make any alterations in the draft charter which might appear to them desirable, and to promote a Bill for the incorporation of Yorkshire College in the university when founded, and to take such steps as would tend to secure the foundation of a university for Yorkshire.

Sir W. Anson, M.P., Parliamentary Secretary to the Board of Education, distributed the prizes to the students at the Goldsmiths' Company's Technical Institute, New Cross, S.E., on December 2, and delivered an address on education, during which he urged the claims of a wide culture and of a broad curriculum. In the course of his remarks Sir William remarked it was no disparagement to language, to history, and to literature to say that they did not explain the wonders of the world around them. It was no disparagement to science to say that it did not reveal to us the great facts and the great thoughts of the men of the past. He believed that practical business men were beginning to find that a liberal education was a good foundation for subsequent scientific and technological study when that had to be applied to business. They were beginning to discover that a man who had had what he would call a liberal education in language, history and literature had thereby laid a good foundation for scientific study or technological study, and that he was more useful for practical purposes than the man who had devoted his whole life to the limited area of one subject of scientific or technological pursuit.

A conference of Welsh county councils' representatives on the question of establishing a school of forestry for Wales and Monmouthshire was held recently at Haverfordwest. Mr. E. Robinson, of Boncath, who inaugurated the movement, explained that their object was to plant waste and at present unproductive woodlands in Wales. A school could be established with 100 to 200 acres of land to start with, and the option of acquiring a further 500 or 800 acres, and the total capital outlay ought not to exceed 5000*l.* to 8000*l.*, which could be contributed by the councils according to their rateable values. He believed the Government would contribute about half the amount required, and he assumed that an annual grant of 100*l.* from each of the councils would be sufficient to cover all out-of-pocket expenses, and give a good return on capital. There were about a million acres of waste land in the Principality which could grow timber. The planting would cost not more than 6*l.* an acre. Spread over thirty years, that would require a yearly grant of 100,000*l.* from the Government, the money to be repaid in that period by half-yearly instalments, and by the end of that time they should have plantations worth from 30,000,000*l.* to 40,000,000*l.* In the whole country there were 21 million acres of waste land and quite 8 millions suitable for planting, which in fifty years would be worth fully 650,000,000*l.* sterling. A resolution was adopted that it was desirable to establish a school of forestry for the whole of South Wales and Monmouthshire.

Mention has already been made (p. 70) of the conference of teachers to be held on January 7–9 under the auspices of the Technical Education Board of the London County Council. The meetings will be held, as in previous years, at the South-western Polytechnic, Manresa Road, Chelsea, S.W. The arrangements for the first day have been made in conjunction with the Geographical Association, and those for the second day in conjunction with the Modern Language Association. The subjects to be discussed in connection with the teaching of geography were announced in our previous note on the meetings. At the sixth meeting, on Saturday, January 9, at 2 o'clock, Prof. J. Perry, F.R.S., will take the chair. Addresses will be delivered by Mr. W. Hibbert on "New Apparatus for the Teaching of Electricity and Magnetism," and by Mr. R. W. Bayliss on "Practical Work in the Teaching of Geometry." A large exhibit of maps, globes, slides and apparatus illustrative of practical methods of teaching geography has been collected by the Geographical Association. Short explanatory lectures will be given on the collection on Tuesday afternoon, January 5, and every subsequent afternoon during the week. There will also be an important art exhibition, including an interesting loan collection of fifteenth and sixteenth century herbals and finely illustrated botanical works, together with a number of plant drawings by John Ruskin and his pupils. No charge will be made for admission to the conference or exhibitions. Application for tickets of admission should be made to Dr. Kimmins, 116 St. Martin's Lane, W.C., or Mr. C. A. Buckmaster, 16 Heathfield Road, Mill Hill Park, W.

In an address at the Municipal Technical Institute, West Ham, on Thursday last, Sir William White remarked that both elementary and higher technical education are necessary for national progress. There is the technical education which belongs to those who are trained from the first with the idea of becoming directors, managers, heads of businesses. This may be called the higher technical training for those who are intended to be captains of industry. Both kinds of training are necessary. The time has passed when the idea prevailed that technical instruction for the artisan should be limited to the workshop or the factory. Skill in handicraft and knowledge of practice and precedent no longer suffice. Every man engaged in industrial work should have the opportunity, if he so desires, of acquiring a knowledge of principles as well as of processes. For the workers themselves such knowledge is advantageous. Work done intelligently must be better done. From well-instructed workers better results are obtained than from others not so well informed. It is reasonable, also, to anticipate that from trained men should come more valuable suggestions for improvements in methods and processes that may reduce the cost of production and advance manufacture. In the stress of industrial competition, ever increasing in severity, it is absolutely necessary to the maintenance of our national position in the markets of the world that no advantage which technical training can give should be unrealised. Elementary technical instruction adapted to the working classes is by common consent a necessity of any scheme of State-aided technical instruction, and it seemed to Sir William White that to devote attention solely to higher technical instruction and to lavish our resources upon it exclusively, or even chiefly, would be a fatal mistake in the national interest. For sixty years the Admiralty has had a system of technical training for dockyard apprentices at the Royal dockyards, and there is no system of elementary technical education in existence that, in his judgment, has been so thoroughly proved. It is no exaggeration to say that this Admiralty system of training has produced the majority of the men who are now occupying the leading positions in the shipbuilding industry of this country; that it has given to the private shipbuilders its leaders, who have risen from the working classes; and that it has produced many men holding responsible positions in other parts of the world.

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, November 18.—Dr. W. A. Tilden, F.R.S., president, in the chair.—The union of carbon monoxide and oxygen, and the drying of gases by cooling, by Mr. A. F. **Girvan.** A series of experiments with various cooling agents was made, to determine whether aqueous vapour could be so far removed from mixtures of these two gases by cooling that they could no longer be exploded electrically. It was found that after having been cooled to a temperature of -35° the mixture exploded feebly, and that if it had been cooled to below -50° explosion did not occur; whence it appears that there must be at least one molecule of water in 24,000 molecules of the mixture in order that such mixtures may explode.—Simplification of Zeisel's method of methoxyl and ethoxyl determinations, by Dr. W. H. **Perkin,** sen., F.R.S. The vertical condenser and washing bulbs are dispensed with, it having been found that the hydriodic acid is completely retained by using a long-necked distilling flask with its side arm arranged to slope slightly upwards.—The rusting of iron, part ii., by Dr. G. T. **Moody.** The salts which inhibit the formation of "rust" on iron are divisible into two classes, viz. those which are strongly alkaline, and therefore absorb carbon dioxide, *e.g.* sodium phosphate and borate, and those which are decomposed by carbon dioxide, *e.g.* sodium nitrite, acetate, and formate. The author is of opinion that the non-formation of "rust" in presence of these salts is due, therefore, to their removal of carbon dioxide from the air, and not, as was suggested by Dunstan, to their property of destroying hydrogen peroxide.—Constitution of ethyl cyanoacetate. Condensation of ethyl cyanoacetate with its sodium derivative, by Messrs. F. G. P. **Remfry** and J. F. **Thorpe.**—The action of water and dilute caustic soda solutions on crystalline and amorphous arsenic, by Mr. W. T. **Cooke.** Amorphous arsenic is dissolved to a minute extent only, by prolonged ebullition of the element in water or aqueous solutions of sodium hydroxide even in presence of air. The crystalline form of the element, on the other hand, is also only slightly soluble in water and caustic soda solutions in presence of inert gases, but in presence of air the solubility is greatly increased.—Note on a double chloride of molybdenum and potassium, by Prof. G. G. **Henderson.** A description of the method of formation and of the properties of this salt, the composition of which is represented by the formula $3KCl,MoCl_3,2H_2O$, was given.—The action of benzamidine on olefinic-β-diketones, by Dr. S. **Ruhemann.**—Dissociation constants of trimethylenecarboxylic acids, by Messrs. W. A. **Bone** and C. H. G. **Sprankling.** A comparison of the values of these dissociation constants with those of the corresponding saturated open-chain acids shows that the formation of a closed ring increases the values of these constants.—The elimination of hydrogen bromide from bromo-*gem*-dimethylsuccinic acid and from bromotrimethylsuccinic anhydride, by Messrs. W. A. **Bone** and H. **Henstock.**

Mineralogical Society, November 17.—Dr. Hugo Müller, F.R.S., president, in the chair.—Mr. R. H. **Solly** gave a detailed description of various minerals from the Binnenthal, five of which had not been identified with existing species. These five minerals all contain lead, arsenic and sulphur, but sufficient material for complete analyses has not yet been obtained. Three of them are red transparent minerals having each one perfect cleavage and a similar vermilion streak, but differing crystallographically: one is apparently orthorhombic with (100), $(110)=39^\circ\ 16'$, (010), $(011)=52^\circ\ 57'$ and (001), $(101)=42^\circ\ 43'$; another is oblique with $\beta=78^\circ\ 46'$, (100), $(101)=42^\circ\ 22'$ and (010), $(111)=37^\circ\ 3'$; while the third has a zone at right angles to the perfect cleavage with angles of approximately 30° and 60°. The other two minerals, which could not be identified with any of the other sulpharsenites of lead previously described by the author, are black with metallic lustre. One of these is oblique with $\beta=81^\circ\ 11'$, (100), $(101)=40^\circ\ 7'$, (010), $(111)=55^\circ\ 26'$; it has a perfect cleavage (100), and, like liveingite, exhibits no oblique striations on the planes in the zone [100, 001]. The other mineral is also oblique with $\beta=89^\circ\ 40'$, (100), $(101)=46^\circ\ 18'$, and (010), $(111)=59^\circ\ 56'$; it has a perfect cleavage (100), and, like rathite, exhibits numerous oblique striations on the planes in the zone [100, 001]. On fine brilliant crystals of sartorite recently obtained by the author he has been able to confirm the oblique symmetry which he had previously announced, and to determine accurately the elements, $\beta=88^\circ\ 31'$, $(100)\ (101)=54^\circ\ 45'$, $(010)\ (111)=69^\circ\ 52\frac{1}{2}'$. Amongst other specimens from the dolomite of the Lengenbach in the Binnenthal, the author exhibited and described peculiar rounded crystals of galena resembling seligmannite, hyalophane crystals twinned according to the Carlsbad law and showing three new forms, a green mica which was determined to be anorthic, albite and biotite, minerals which have not yet been hitherto recorded from the locality, and barytes in green crystals. Of specimens from the Ofenhorn, the author exhibited some remarkably fine crystals of anatase, and crystals of laumontite, a mineral new to the locality.—Mr. L. J. **Spencer** described crystals of adamite from Chili which were remarkable for their strong pleochroism.—Mr. G. F. Herbert **Smith** discussed the prismatic method of determining indices of refraction. From observations of the angles of incidence and deviation the refractive index and direction of the wave-front in the crystalline medium could be found. By using pairs of faces in the same zone and different angles of incidence a series of refractive indices is obtained which, when plotted with the direction angle as ordinate, gives in general a double curve. Three of the critical values are the principal indices, the fourth corresponding to the direction parallel to the zone-axis. The angles of polarisation with respect to the zone-axis provide a means of discriminating between the doubtful values. A description was given of an inverted goniometer whereby observations could be made in media other than air.

Linnean Society, November 19.—Prof. S. H. Vines, F.R.S., president, in the chair.—The Rev. John **Gerard,** S.J., exhibited a fasciated rose sent by the Rev. J. Dobson, of St. Ignatius's College, St. Julian, Malta, with this note:—"A freak of a white climbing rose, in which eight or nine blossoms with their stalks have grown together."—The Rev. R. Ashington **Bullen** brought for exhibition an albino mole, from a farm near Bagshot; it was wholly of a light fawn colour, and no similar specimen had been seen for at least twenty years, though many moles had been trapped on the same farm.—Dr. M. T. **Masters,** F.R.S., gave an abstract of his paper, a general view of the genus Pinus. The author stated that the object of the paper was to discuss the nature and value of the characters made use of in discriminating the various species of Pinus, and to supply additional points of distinction derived from the anatomical structure of the leaf and other sources. The author has framed an analytical table of the species, which, although mainly artificial, may be of assistance hereafter in facilitating the determination of the species, and in arranging them in more natural groups. The two main divisions adopted are the thin-scaled pines or Tenuisquamæ, and the thick-scaled pines or Crassisquamæ, according to the relative thickness of the cone-scales. Further subdivisions are founded on various points of distinction.—Contributions to the embryology of the Amentiferæ, part ii., *Carpinus Betulus,* by Dr. Margaret **Benson** and Miss Elizabeth **Sanday.** More than 500 accurately orientated, stained and mounted series of sections were obtained through ovules containing the earlier stages in the development of the numerous embryo-sacs, until the segmentation of the definitive nucleus and of the egg occurred. Former observations (see part i. in *Trans.* Linn. Soc., ser. 2, bot. iii. (1894), pp. 409–424) were confirmed and the following new facts obtained. The polar nuclei meet at the neck of the cæcum, descend together and ultimately fuse near its base. The pollen-tube enters the sac in their vicinity, and provides some means of exit for one male gamete, which seems to be emitted into the cæcum